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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/092,526	03/08/2002	Hisao Shigematsu	981380A	4590
38834	7590	03/23/2006	EXAMINER	
WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP			RICHARDS, N DREW	
1250 CONNECTICUT AVENUE, NW			ART UNIT	
SUITE 700			PAPER NUMBER	
WASHINGTON, DC 20036			2815	

DATE MAILED: 03/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.



## Office Action Summary

Application No.

10/092,526

Applicant(s)

SHIGEMATSU ET AL.

Examiner

N. Drew Richards

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 03 January 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 13, 14, 16, 17, 19-24 and 26 is/are pending in the application.
- 4a) Of the above claim(s) 14, 16, 19, 22-24 and 26 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 13, 17, 20 and 21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 March 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☒ Certified copies of the priority documents have been received in Application No. 09/191,543.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |



## DETAILED ACTION

### *Election/Restrictions*

1. Applicant's election of Species I, claims 13, 15, 17, 20, 21, and 25 in Paper No. 6 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)). In response to the Office Action mailed 4/22/05, applicant has pointed out that claim 18 is also part of the elected species. Thus, claims 13, 15, 17, 18, 20, 21 and 25 are considered herein.

2. Claims 14, 16, 19, 22 – 24, and 26 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 6.

### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 13, 17 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimawaki (USPAT 5903018) in view of Tanoue et al. (USPAT 5598015, Tanoue) further in view of Mochizuki et al. (USPAT 5481120, Mochizuki).



With regard to claim 13, Shimawaki discloses in figures 3 – 7 a method for fabricating a semiconductor device. Shimawaki discloses in figure 3 forming a first semiconductor layer (4) over a semiconductor substrate (1). Shimawaki teaches in figure 3 and column 5, lines 31 – 32 wherein the semiconductor substrate is made of a GaAs semiconductor substrate. Shimawaki is silent to the substrate being formed of an InP semiconductor substrate. Tanoue teaches in figures 1 – 11 and column 3, lines 30 – 31 wherein a first semiconductor layer (2/3) is formed over an InP substrate. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the InP substrate of Tanoue in the method of Shimawaki in order to increase the cutoff frequency of the device by selecting materials that can be used for the same purpose as stated by Tanoue in column 5, lines 27 – 42, column 5, lines 48 – 49, and column 6, lines 9 – 29. (See MPEP 2144.06 and 2144.07). Shimawaki discloses in figure 3 and column 5, lines 29 – 55 and column 7, lines 54 – 60 forming a base layer (5) of a carbon doped  $\text{Ga}_x\text{In}_{1-x}\text{As}_y\text{Sb}_{1-y}$  layer on the first semiconductor layer. Shimawaki discloses in figure 3 forming a second semiconductor layer (7) on the base layer. Shimawaki discloses in figure 4 patterning the second semiconductor layer in a mesa shape. Shimawaki discloses in figure 6 and column 6, lines 40 – 55 forming a base contact layer (12) on the base layer exposed by patterning the second semiconductor layer. Shimawaki is silent to the base contact layer being of a carbon-doped GaAsSb layer or a carbon doped GaInAsSb layer. Mochizuki teaches in figure 6 and column 11 lines 1-20 forming a carbon-doped GaAsSb base contact layer 16 on a GaAs base layer. It would have been obvious to one of ordinary skill in the art at the time of the



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present invention to use the GaAsSb base contact layer of Mochizuki in the method of Shimawaki to improve the carrier concentration and mobility in the base region so that the base resistance is reduced and a very high speed HBT is realized. Shimawaki discloses in figure 6 forming a base electrode 14 on the base contact layer. Shimawaki discloses in figure 7 and column 5, lines 29 – 55 wherein the second semiconductor layer is an emitter layer of an AlGaAs layer. Shimawaki does not teach that the emitter layer is of an InP layer. Tanoue teaches in figures 1 – 11 and column 3, lines 30 – 31 in which a second semiconductor layer is an emitter layer of an InP layer. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the InP emitter of Tanoue in the method of Shimawaki in order to increase the cutoff frequency of the device by selecting materials that can be used for the same purpose as stated by Tanoue in column 5, lines 27 – 42, column 5, line 51, and column 6, lines 9 – 29. (See MPEP 2144.06 and 2144.07).

With regard to claim 17, Shimawaki discloses in figure 6 and column 6, lines 40 – 55 wherein in the step of forming the base contact layer, the base contact layer is formed of a material which lattice matches with a material forming the base layer. It should be noted that lattice matching results from the MOMBE (metal organic molecular beam epitaxy) process used to form the base contact layer.

With regard to claim 21, Shimawaki discloses in figure 5 after the step of patterning the second semiconductor layer, a step of forming a sidewall insulation film (18) on a sidewall of a mesa of the second semiconductor layer.



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5. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shimawaki and Tanoue as applied to claim 13 above, and further in view of Hashimoto et al. (USPAT 5846869, Hashimoto).

Shimawaki discloses in figure 6 and column 6, lines 1 – 13 and 50 – 51 depositing the base layer by MOCVD epitaxial deposition process. Shimawaki and Tanoue are silent to, before the step of forming the base contact layer, a step of thermal treating for eliminating hydrogen in the base layer. Hashimoto teaches in figures 18 – 20 and column 11, line 56 – column 12, line 31, before the step of forming a layer overlying a base layer, a step of thermal treating for eliminating hydrogen in the base layer introduced during the deposition of the base layer by an epitaxial process. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the thermal treating of Hashimoto before the step of forming the base contact layer in the method of Shimawaki and Tanoue in order to improve the amplification factor of the bipolar transistor as stated by Hashimoto in column 11, line 56 – column 12, line 31. It would have been further obvious in the method of Shimawaki, Tanoue, and Hashimoto the eliminated hydrogen would have been due to the epitaxial MOCVD process of Shimawaki. It should further be noted that the limitation “for eliminating hydrogen” is an intended use limitation that is met by the combination of Shimawaki, Tanoue, and Hashimoto. It is noted that the amendment to claim 20 still requires the same thermal treatment step taught by the prior art and thus is obvious over the prior art.



***Response to Arguments***

6. Applicant's arguments filed 2/14/05 have been fully considered but they are not persuasive.

Applicant argues that the base layer of Mochizuki et al. like Shimawaki clearly differs from that of the present invention. This is not persuasive since the base layer of Shimawaki, as admitted by applicant on page 8 line 14, is InGaAs as claimed.

Applicant also argues that Mochizuki et al. fails to teach the base contact layer of carbon-doped GaAsSb or carbon-doped GaInAsSb formed on the base layer of a carbon-doped InGaAs or carbon-doped GaAsSb. This is not persuasive since Mochizuki et al. was not relied upon for teaching both the base layer and the base contact layer. Mochizuki was merely relied upon to teach the base contact layer and provided motivation for using the base contact layer in the method of Shimawaki.

Applicant also argues that both Shimawaki and Mochizuki et al. fail to teach or suggest the combination of base layer and base contact layer as claimed and thus one of ordinary skill in the art would not form the layers as claimed. This is not persuasive. This argument ignores the motivation used in the rejection that suggests the desirability of combining the base contact layer of Mochizuki et al. into the method of Shimawaki. Proper motivation was given for the combination and thus one of ordinary skill in the art would form the layers as claimed.

Applicant argues that one of ordinary skill in the art would not have formed the AlGaAs/GaAs-based HBT of Shimawaki on the InP substrate of Tanoue since the GaAs substrate must be used in order to lattice-match the HBT layers with the substrate. This



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is not persuasive. The fact that one might, in one instance, not form the AlGaAs/GaAs-based HBT on InP because of lattice matching issues does not preclude one of ordinary skill in the art being motivated to perform the combination in another instance. In this case proper motivation has been given as to why one would desire the combination and thus the rejection is considered proper.

Applicant states "one of ordinary skill in the art would never apply the combinations of the materials forming the InP/InGaAs-based HBT formed on the InP substrate to the AlGaAs/GaAs-based HBT formed on the GaAs substrate. This argument is merely speculation by the attorney and does not constitute evidence on the record. This statement does not overcome the motivation given in the rejection for why one of ordinary skill in the art would desire the combination claimed.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

With regard to claim 20, applicant has argued that the thermal treatment of Hashimoto is conducted for a different reason than in the instant application and thus does not read on the thermal treatment as claimed. This is not persuasive since the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd.



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Pat. App. & Inter. 1985). In this case, the thermal treatment of Hashimoto is desirable to improve the amplification factor of the bipolar transistor as stated by Hashimoto in column 11, line 56 – column 12, line 31. In performing this treatment, the claimed hydrogen elimination will necessarily occur and thus the thermal treatment of Hashimoto in the method of Shimawaki and Tanoue reads on the claimed invention.

### ***Conclusion***

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to N. Drew Richards whose telephone number is (571) 272-1736. The examiner can normally be reached on Monday-Friday 9:00-5:00.



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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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AU 2815